TOPIC: Transcriptomic Fingerprint Technology in Food Safety

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Address:
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Present position:
Professor of Toxicology at the University of Zürich

BIOGRAPHY

Toxicology is the study of the adverse effects of chemicals and biological substances on Libiny organisms. The Naegeli group is active in different areas ranging from molecular toxicology (DNA repair, endocrine disruptors), to food toxicology (detection of phytoestrogens, mycotoxins and pesticides), and to clinical toxicology. They are using advanced methods of molecular biology combined with live-cell-imaging and DNA microarrays to study typical reaction patterns of human cells in response to toxic insults.

Education and academic positions

1985	Graduation from School of Veterinary Medicine, Zürich
1988-1989	Participant at the “Postgraduate Course in Experimental Medicine and Biology” at the University of Zürich
1989	Doctoral degree, Institute of Pharmacology and Biochemistry, University of Zürich
1990	Postdoctoral fellow, Department of Pathology, Stanford University Medical School, Stanford CA, USA
1991-1992	Postdoctoral fellow, Department of Pathology, The University of Texas Southwestern Medical Center at Dallas, Dallas TX, USA
1993	“Oberassistent”, Institute of Veterinary Pharmacology and Toxicology, University of Zürich
1995	Participant at the Postgraduate Training “Course on Veterinary Toxicology“, Wuppertal, Germany
1996	Promotion to “Abteilungsleiter”, Head Toxicology Division
1998	Degree of “Privatdozent” (Habilitation) for Phamacology and Toxicology
since 2000	Delegate of the Vetsuisse-Faculty at the Swiss Academy of Medical Sciences
2002	Promotion to Professor *ad personam* at the University of Zürich
2006	Nomination to Professor of Toxicology at the University of Zürich (“Lehrstuhl Toxikologie”)

ABSTRACT

Transcriptomic fingerprinting technology in food safety

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The goal of tranomic fingerprinting is to improve food safety by using cultured human cells as versatile biological detectors ("cytosensors") of toxic contaminants. This new strategy is prompted by the finding that living cells respond to toxic chemicals by changing the pattern of genes that are converted into messenger RNA trans. Each individual RNA tran carries the information for the synthesis of a particular protein product. The term "tranome" refers to the entire spectrum of such messenger RNA intermediates in a given biological system. Accordingly, "tranomics" stands for large-scale analytical methods that can be used to monitor complex RNA profiles consisting of thousands of trans. The general scheme of contaminant detection by tranomic fingerprinting is as follows. Cultured human cells are exposed to extracts prepared from food samples (meat, milk, cereals, etc.). Following an incubation time of 3-24 hours, messenger RNA trans are isolated, labelled and detected on high-throughput DNA microchips. Different contaminants generate characteristic changes in the tranional pattern, thus giving rise to diagnostic RNA fingerprints that can be used to recognise and quantify hazardous constituents. In the of the BioCop project, we have adapted a miniaturised DNA microarray platform to determine tranional fingerprints induced by estrogenic endocrine disrupters as well as type A trichothecenes. With exception of a portable reader, this tranomic platform requires no specialised equipment and, hence, can be easily disseminated. A key advantage is that this novel test exploits health-relevant parameters in a toxicologically significant target system. With the widespread use of rapid screening tests, which are not related to any toxicological endpoint, effect-driven in vitro bioassays will become of increasing importance to support risk assessment and monitor the success of risk management actions.

Keywords: Mycotoxin, Trichothecene, Phytoestrogen, Endocrine Disruptor

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